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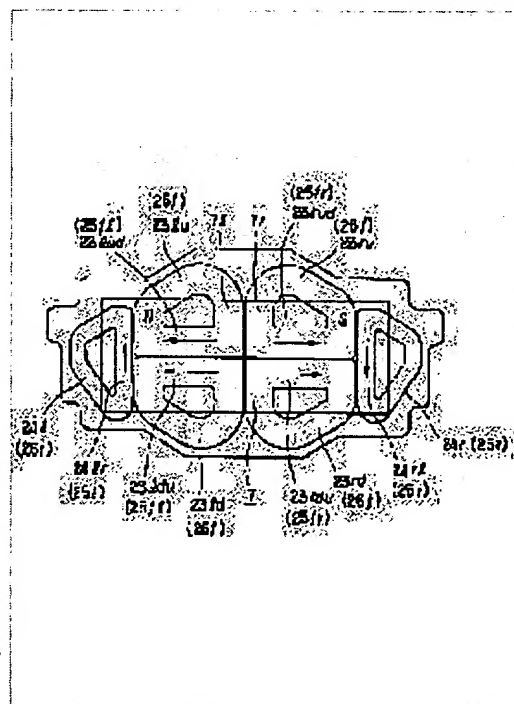
(54) BIAXIAL ACTUATOR FOR OPTICAL PICKUP DEVICE

(57)Abstract:

PURPOSE: To miniaturize the actuator, to make a movable part light in weight by as much as the proposed miniaturization and to make response characteristic excellent by reducing an ineffective conductor part.

CONSTITUTION: As for the effective conductor part 25 of a focusing coil 23 and a tracking coil 24 which is opposed to a magnet 7 and contributes to the generation of driving force; the effective conductor part 25f of the focusing coil (the effective conductor part 25fl of a left side focusing coil and the effective conductor part 25fr of a right side focusing coil), and the effective conductor part 25t of the tracking coil (the effective conductor part 25tl of a left side tracking coil and the effective conductor part 25tr of a right side tracking coil) are formed to be

nearly linear. The ineffective conductor part 26 thereof which is not opposed to the magnet and does not contribute to the generation of the driving force is formed in a different shape by rectangularly winding the coils so that the entire length of the focusing coil and the tracking coil including the effective conductor part may be shorter than the entire length of the focusing coil and the tracking coil having the effective conductor part of the same length.



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CLAIMS

[Claim(s)]

[Claim 1] It is the biaxial actuator of the optical pickup which has the focusing coil and tracking coil which were wound spirally. It consists of a part. the above-mentioned focusing coil and/or a tracking coil counter with a magnet, and are contributed to generating of driving force -- effective -- a conductor -- the invalid which does not counter with a part and a magnet and does not contribute to generating of driving force -- a conductor -- the above -- effective -- a conductor -- a part is formed in the shape of an abbreviation straight line -- having -- moreover, the above-mentioned invalid -- a conductor -- a part -- the above -- effective -- a conductor -- the die length of the focusing coil containing a part or the whole tracking coil it is wound around a rectangle and the same die length is effective -- a conductor -- the biaxial actuator of the optical pickup characterized by forming in the shape of an anomaly so that it may become short as compared with the die length of the focusing coil which has a part, or the whole tracking coil.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the biaxial actuator of a new optical pickup. devising the configuration of the tracking coil of a biaxial actuator, and/or a focusing coil in detail -- an invalid -- a conductor -- while lessening a part and attaining a miniaturization, lightweight-ization of the part moving part tends to be attained, and it is going to offer the biaxial actuator of the new optical pickup which can make a response property good.

[0002]

[Description of the Prior Art] As for the tracking coil and focusing coil in a biaxial actuator of an optical pickup, what wound copper wire spirally [square tubed or a rectangle], and formed it was common.

[0003] Drawing 9 thru/or drawing 11 show an example a of the biaxial actuator of the conventional optical pickup.

[0004] The tabular base substrate b of eye ** thickness with which the biaxial actuator a carried out the rectangle The parallel links d and d of four where the end was supported by printed circuit board c which protruded from the end section of this base substrate b, and ..., The lens attachment component f which holds objective lens e while being supported between these parallel links d and d and the free end of ... The focusing coil g for actuators attached in this lens attachment component f, and the tracking coils h and h, While being attached on the above-mentioned base substrate b, it consists of the magnet j attached in York i which carried out the shape of U character arranged so that some of focusing coils g and tracking coils h and h may be inserted from both sides, and this York i.

[0005] The base substrate b consists of a non-magnetic material, and Bore k is formed in a part for the other end flank of the longitudinal direction.

[0006] While consisting of the metallic material with which the parallel links d and d and ... have conductivity and supporting the lens attachment component f as mentioned above, between the predetermined circuit pattern on printed circuit board c, and the above-mentioned focusing coil g and the tracking coils h and h is connected electrically, and electric supply of the focusing coil g and the tracking coils h and h is performed.

[0007] The hole l of the rectangle which the lens attachment component f consisted of the non-magnetic material which carried out tabular [of the abbreviation rectangle of eye ** thickness], and the above-mentioned objective lens e was supported by the location which approached the other end in the longitudinal direction of the lens attachment component f, and carried out opening to the abbreviation center section comparatively greatly is formed.

[0008] And such a lens attachment component f is in the condition supported by the above-mentioned printed circuit board c through the parallel links d and d of four, and ... Two pieces which the above-mentioned objective lens e is located above the bore k of the base substrate b, and carry out phase opposite in above-mentioned York i while being located in the above-mentioned base substrate b and abbreviation parallel (it is hereafter called "inner York" and "outside York", respectively.) m and n are located where it has ***** in the rectangle hole l. In addition, the piece by the side of printed circuit

board c is inner York m among York i, and the piece by the side of objective lens e is outside York n. [0009] York i bends the plate-like part material which consists of a magnetic material in the shape of U character, is formed, it is the sense which carries out opening to the abbreviation center section of the above-mentioned base substrate b toward the upper part, and it is arranged so that inner York m and outside York n may estrange in the longitudinal direction of the base substrate b.

[0010] Magnet j is attached in the medial surface of inner York m, and, thereby, Field o is formed between this magnet j and outside York n.

[0011] The focusing coil g winds and grows into square tubed, looks at copper wire at a flat surface, and the three sides are stuck on the inside except the inside by the side of objective lens e among the four sides among the inner skin of the above-mentioned rectangle hole l of the lens attachment component f. By this One side p by the side of objective lens e of the focusing coil g is located so that it may build over two fields and fields of the rectangle hole l which carry out phase opposite, and this part p is located in the above-mentioned field o.

[0012] and when electric power is supplied so that the part p of the focusing coil g located in the above-mentioned field o may mention later, it acts with a magnet and contributes to generating of driving force -- effective -- a conductor -- the invalid which it is a part, and the other part (part stuck on the inner skin of the above-mentioned rectangle hole l) does not counter with a magnet, and does not contribute to generating of driving force -- a conductor -- it is a part.

[0013] So that the tracking coils h and h may wind copper wire spirally [a rectangle], and may change and it may rank with the lateral surface of one side p located in the above-mentioned field o among the focusing coils g in a longitudinal direction And it is attached so that only one side q and q may counter the above-mentioned magnet j in a side [each tracking coils h and h adjoin], and thereby, the two sides q and q where two tracking coils h and h adjoin are located in the above-mentioned field o. Moreover, when the tracking coil h and h top Norikazu sides q and q supply electric power to the tracking coils h and h, a current flows in the same direction.

[0014] and when electric power is supplied so that the parts q and q of the tracking coils h and h located in the above-mentioned field o may mention later, it acts with a magnet and contributes to generating of driving force -- effective -- a conductor -- the invalid which serves as a part and the part which has not countered with the magnet of the other part does not contribute to generating of driving force -- a conductor -- it is a part.

[0015] drawing 11 (a) -- the focusing coil g top Norikazu side p and physical relationship with Magnet j -- moreover, drawing 11 (b) shows the tracking coil h and h top Norikazu sides q and q and physical relationship with Magnet j.

[0016] If a deer is carried out and electric power is supplied to the focusing coil g, the migration force of going in the upper part or the lower part according to the sense of the current between the focusing coil g top Norikazu side p located in the above-mentioned field o and Magnet j will arise, and, thereby, the lens attachment component f will be moved in the vertical direction (the direction of focusing) to the base substrate b.

[0017] Moreover, if electric power is supplied to the tracking coils h and h, the migration force of going to the left according to the sense of the current or the method of the right will arise between the tracking coil h and h top Norikazu sides q and q located in the above-mentioned field o, and Magnet j, and, thereby, the lens attachment component f will move horizontally (the direction of tracking) to the base substrate b.

[0018]

[Problem(s) to be Solved by the Invention] However, if it is in the above-mentioned biaxial actuator a of the conventional optical pickup the inside of the biaxial actuator a -- moving part (mainly -- the lens attachment component f and objective lens e --) the part of each coil contributed to the driving force to which the focusing coil g and the tracking coils h and h are moved -- the above -- effective -- a conductor, in spite of being only Parts p, q, and q other invalids -- a conductor -- the part was too large, the miniaturization of the biaxial actuator a could not be attained, and the weight of moving part became heavy, and there was a problem that a response property was bad.

[0019]

[Means for Solving the Problem] Then, the biaxial actuator of this invention optical pickup A part is formed in the shape of an abbreviation straight line. in order to solve the above-mentioned technical problem, it counters with the magnet of a focusing coil and/or a tracking coil, and contributes to generating of driving force -- effective -- a conductor -- moreover, the invalid which does not counter with a magnet and does not contribute to generating of driving force -- a conductor -- a part the above -- effective -- a conductor -- the die length of the focusing coil containing a part and/or the whole tracking coil is wound around a rectangle, and the same die length has it -- a conductor -- it forms in the shape of an anomaly so that it may become short as compared with the die length of the focusing coil which has a part, and/or the whole tracking coil. [effective]

[0020] In addition, in this specification, since the focusing coil or tracking coil used in a common biaxial actuator is wound around the rectangle when calling it "the shape of an anomaly", it is the word used to this "rectangle."

[0021]

[Function] therefore, the magnet [according to this invention optical pickup] in a focusing coil and/or a tracking coil and the invalid which does not counter -- a conductor -- the die length of a part is wound by the rectangle and the same die length is effective -- a conductor -- it can shorten as compared with it of the focusing coil which has a part, and/or a tracking coil, a miniaturization and lightweight-izing of the part and a coil can be attained, and, thereby, the response property of a biaxial actuator can be raised.

[0022]

[Example] Below, it explains according to an example 1 of the operation which showed the detail of the biaxial actuator of this invention optical pickup to the accompanying drawing.

[0023] In addition, this example 1 forms a focusing coil and a tracking coil by forming a variant circuit pattern in a printed circuit board.

[0024] The biaxial actuator 1 consists of the base substrate 2 which consists of a magnetic metallic material, the lens attachment component 5 which held the objective lens 3 and was supported by the base member 2 through the parallel links 4 and 4 and ..., York 6 formed in the above-mentioned base substrate 2, the magnet 7 attached in this York 6, and the coil substrate 8 grade supported by the above-mentioned lens attachment component 5.

[0025] The base substrate 2 succeeds in an abbreviation rectangle in a flat-surface configuration, and is a front end edge (the direction which goes to the method of the diagonal below in drawing 1 is made into a before side, and the direction which goes to the method of the diagonal left is made into the backside.) to the location of the both-sides approach of the front end section. Moreover, let the direction which makes the direction which goes to the method of the diagonal right left-hand side, and goes to the method of the diagonal below be right-hand side. When the following explanation sets and the sense is shown, it shall depend in this direction. Two slits are formed so that opening may be carried out. Raise the part between these two slits and York 9 is formed the outside of above-mentioned York 6. Moreover, a slit is formed in the shape of [of the sense which carries out opening to the part between York 9 outside this, and the back end edge of the base substrate 2 at the outside York 9 side] a KO character. By raising the part surrounded by this slit, inner York 10 of York 6 is formed, and proper spacing is formed between these outside York 9 and inner York 10.

[0026] The magnet 7 is carrying out tabular [of an oblong rectangle], and the unlike pole is magnetized in the longitudinal direction and front flesh side, respectively. Namely, front (anti-York attachment side) 7lf of 7l. of left-hand side parts of a magnet 7 and tooth-back (York attachment side) 7rb of right-hand side partial 7r of a magnet 7 For example, it is magnetized by N pole again so that tooth-back (York attachment side) 7lb of 7l. of left-hand side parts of the front (anti-York attachment side) 7rf and the magnet 7 of right-hand side partial 7r of a magnet 7 may become the south pole. Such a magnet 7 is stuck on the field which counters York 9 outside York 10 in the above. By this 7l. of 7l.-magnet left-hand side parts of magnet left-hand side partial The left-hand side part of outside York 9 A magnetic circuit called 7l. of left-hand side partial-magnet left-hand side parts of York 10 in right-hand side partial - in York 10 in gap-magnet right-hand side partial 7r- between the right-hand side part of York 9

outside right-hand side partial - in York 9 outside left-hand side partial - in York 9 outside gap - between ** and magnet right-hand side partial 7r is formed. Between a magnet 7 and outside York 9, the fields 11l and 11r which are two from which the sense of magnetic flux differs on the left-hand side and right-hand side arise.

[0027] In addition, although the magnet 7 magnetized a polarity which is different in the die-length direction in the one magnetic substance, not only this but two magnets may be put in order and arranged right and left so that the polarities may differ in the direction of a field.

[0028] 12 is the biaxial electrode holder set up by the back end section of the base substrate 2, and it is carrying out tabular [of the oblong rectangle which consists of an insulating material], and it is formed so that the slits 12a and 12a prolonged in the location of the right-and-left both-ends approach in a lengthwise direction may carry out opening to the upper limit.

[0029] It consists of the metal wire rod with which the parallel links 4 and 4 and ... have conductivity, and is implanted in the four corners of the rectangular printed circuit board 13, and this printed circuit board 13 is attached so that it may stick on the tooth back of the biaxial electrode holder 12 with the sense to which the parallel links 4 and 4 of four and ... extend to the front.

[0030] And each parallel links 4 and 4 and ... have the inside of slit 12a of the above-mentioned biaxial electrode holder 12, and 12a let it pass, and it fills up with adhesives in this slit 12a and 12a, and is supported by the biaxial electrode holder 12.

[0031] The lens attachment component 5 succeeds in tabular [which consists of an insulating material], it sees at a flat surface and the rear half succeeds in the shape of an abbreviation rectangle, a configuration which is deflected in the center is carried out as the right-and-left side edge of the front half goes to the front, the hole 14 of a long rectangle is formed in the abbreviation center section at a longitudinal direction, and the above-mentioned objective lens 3 is supported by the front end section.

[0032] The rectangle hole 14 formed in the lens attachment component 5 is somewhat larger than the flat-surface configuration where the magnitude doubled the gap between York 9 outside the above, inner York 10, a magnet 7, and outside York 9 and a magnet 7, and it is formed, and the lens attachment component 5 is in the condition supported by the above-mentioned parallel links 4 and 4 and ..., and outside York 9, inner York 10, and a magnet 7 are located in the rectangle hole 14.

[0033] Although the thickness of the whole is formed smaller than spacing between what the above-mentioned parallel links 4 and 4 and ... estranged up and down, such a lens attachment component 5 Similarly it is formed. the inside of the part of right-and-left both the sides of the rectangle hole 14 -- a before side -- the part of others [part / *****] -- ** -- spacing between the parallel links 4 and 4 thickly estranged to the above-mentioned upper and lower sides, and abbreviation -- moreover, spacing between the parallel links 4 and 4 which are the parts on the backside [hole / 14 / rectangle], and were estranged right and left -- ** -- the narrow part 15 -- lower part HE ** -- it is formed thickly.

[0034] And the heavy-gage part of both the sides of the above-mentioned rectangle hole 14 is used as the parallel links 4 and 4 and the supporters 16 and 16-ed with which the point of ... is combined, and let the heavy-gage part 15 on the backside [the rectangle hole 14] be the balancer section for maintaining the weight balance of the lens attachment component 5 concerned. The magnitude is determined that the balancer section 15 makes in agreement the center of gravity of the lens attachment component 5 concerned, and the drive core by the coil substrate so that it may mention later.

[0035] 17 and 17 are the notches which cut, and were lacked and formed so that the part corresponding to the above-mentioned supporters 16 and 16-ed of the above-mentioned rectangle hole 14 might be penetrated up and down.

[0036] The coil substrate 8 succeeds in the **** configuration which the four corners cut with the abbreviation rectangle aslant, and lacked with it. Furthermore, by right-and-left edges' on both sides projecting slightly to a left and the method of the right, making them into the fitting-ed sections 18 and 18, and carrying out fitting of these fitting-ed sections 18 and 18 to the above-mentioned notches 17 and 17 of the rectangle hole 14, the coil substrate 8 is located in the rectangle hole 14, and is in the condition. From the top face or inferior surface of tongue of the supporters 16 and 16-ed, the vertical both-ends edge of the fitting-ed sections 18 and 18 is slightly projected to the upper part or a lower part,

and is located to it.

[0037] The coil substrate 8 piles up the printed circuit boards 8a, 8b, 8c, and 8d of the thin meat of four sheets, and is formed, and the focusing coil elements 19 and 19, ... and the tracking coil elements 20 and 20, and ... are formed in the printed circuit boards 8a, 8b, 8c, and 8d of each **** as a circuit pattern.

[0038] in addition, each circuit pattern formed in the printed circuit boards 8a, 8b, 8c, and 8d of four sheets -- abbreviation -- since it is formed in the same configuration, only printed circuit board 8a of 1 is explained, and the explanation about other printed circuit boards 8b, 8c, and 8d is omitted.

[0039] A circuit pattern is formed, the focusing coil elements 19 and 19 and ... are formed so that the eddy of four abbreviation trapezoidal shape may be wound around the part except the right-and-left both ends of printed circuit board 8a of thin meat, and a circuit pattern is formed in the right-and-left both ends of printed circuit board 8a of thin meat so that an eddy may be wound around an abbreviation triangle, and the tracking coil elements 20 and 20 are formed.

[0040] The focusing coil elements 19 and 19 and ... The upper left of light-gage printed circuit board 8a, It is arranged so that it may become the point symmetry centering on the core of light-gage printed circuit board 8a in each location of the lower left, the upper right, and the lower right. Each focusing coil element 19 is formed in the shape of [to which side 19a located in the core side in the vertical direction of the light-gage printed circuit board 8a extends horizontally] a straight line. Two side 19b prolonged in an abbreviation perpendicular from the both ends of side 19a prolonged to this horizontal direction, That to which two side 19c is located outside is formed short. 19c forms -- having -- this -- Moreover, it receives horizontally, and 19d of sides to which between the tips of the two sides 19b and 19c which extend to these perpendicular directions is connected inclines, they are formed, and the focusing coil element 19 formed in this way has succeeded in the shape of an anomaly which carried out the abbreviation trapezoid as a whole.

[0041] By this the die length of this focusing coil element 19 The side of the same die length as side 19a temporarily prolonged to the above-mentioned horizontal direction is made into one side. And as compared with the die length of this coil element, it can shorten under the condition that there is a coil element wound so that an eddy might be wound around the rectangle which made the side of the same die length as side 19b of the longer one the side of another side between the two sides 19b and 19c which extend to the above-mentioned perpendicular direction.

[0042] The tracking coil element 20 is horizontally flat to the right-and-left both ends of light-gage printed circuit board 8a, and it is formed in an abbreviation triangle so that side 20a located in the inside may be prolonged perpendicularly. By this The die length of this tracking coil element 20 makes one side the side of the same die length as side 20a temporarily prolonged to the above-mentioned perpendicular direction. And as compared with the die length of this coil element, it can shorten under the condition that there is a coil element wound so that an eddy might be wound around the rectangle which made the side of the same die length as the height when making into a triangular base the side which extends to this perpendicular direction the side of another side.

[0043] It is the through hole where 21, 21, and ... were formed in every place of light-gage printed circuit board 8a, and when the light-gage printed circuit boards 8a, 8b, 8c, and 8d of four sheets are piled up, it is for connecting the focusing coil elements 19 and 19 of the light-gage printed circuit board 8 of 1, ... or the tracking coil elements 20 and 20 and the focusing coil elements 19 and 19 of other light-gage printed circuit boards 8, ..., or the tracking coil elements 20 and 20, respectively.

[0044] 22 and 22 are the electric supply terminals formed in the upper limit section and the lower limit section of a location corresponding to the fitting-ed section 18 on the left-hand side of light-gage printed circuit board 8a with the circuit pattern, respectively, and are for supplying electric power to the focusing coil 23 and the tracking coil 24 at each **. These electric supply terminals 22 and 22 are formed in light-gage printed circuit board 8a and 8d of light-gage printed circuit boards of the 4th layer of the 1st layer. In addition, as a coil substrate 8 In the focusing coils 23, two electric supply terminal 22au(s) (upper part on the left-hand side of [of the 1st layer] light-gage printed circuit board 8a), 22du (s) (upper part on the right-hand side of 8d of the 4th layer of light-gage printed circuit boards) -- moreover, two electric supply terminal 22ad(s) (lower part on the left-hand side of [of the 1st layer]

light-gage printed circuit board 8a) and 22dd (lower part on the right-hand side of 8d of the 4th layer of light-gage printed circuit boards) are formed in the tracking coils 20.

[0045] Such light-gage printed circuit boards 8a, 8b, 8c, and 8d pile up, and the coil substrate 8 is formed. Plating is performed for each focusing coil elements 19 and 19, ... or the tracking coil elements 20 and 20, and ... to the above-mentioned through holes 21 and 21 and ..., and it connects electrically. Moreover, by this The focusing coil elements 19 and 19 and ... constitute one focusing coil 23, and the tracking coil elements 20 and 20 and ... constitute one tracking coil 24.

[0046] The lens attachment component 5 in which such a coil substrate 8 was attached is located so that it may be pinched between the parallel links 4 and 4 where the supporters 16 and 16-ed counter up and down, and the tip of ... The parallel links 4 and 4 and the vertical both-ends edge of the point of ... and both insertion **** 18 and 18 of the coil substrate 8 are combined by soldering, respectively. By this Electrical installation with the above-mentioned electric supply terminals 22 and 22 and ... which were formed in the coil substrate 8, the parallel links 4 and 4, and ... is planned. Moreover, the lens supporter material 5 is attached between the parallel links 4 and 4 and the tip of ... while being combined with the coil substrate 8 by piling solder in the supporters 16 and 16-ed, and it is supported free [migration to the vertical direction and a horizontal direction] to the base substrate 2. In addition, the coil substrate 8 may be beforehand attached in the notches 17 and 17 of the lens attachment component 5 with adhesives.

[0047] And between a magnet 7 and outside York 9 (i.e., the inside of a field 11), after the lens attachment component 5 has been supported by the base substrate 2 through the parallel links 4 and 4 and ..., it approaches and the above-mentioned coil substrate 8 is located so that a magnet 7 and outside York 9 may not be contacted.

[0048] Moreover, the lens attachment component 5 is set in the condition that external force has not joined this. Right-hand side partial 24lr counters 7l. of parts on the left-hand side of a magnet 7 among tracking coil 24l. located in upper part 23ldu and left-hand side of partial 23ld located in lower part 23lud and the lower left of partial 23lu located in the upper left among the focusing coils 23. Again Among the focusing coils 23, at the upper right Left-hand side partial 24rl counters partial 7r on the right-hand side of a magnet 7 among tracking coil 24r located in upper part 23rdu and right-hand side of partial 23rd located in lower part 23rud and the lower right of partial 23ru in which it is located (refer to drawing 8).

[0049] In addition, partial 23lud which countered the above-mentioned magnet 7 among the parts of each coils 23 and 24, 23ldu(s) and 23 -- it contributes to generating of driving force so that rud, 23rdu, 24lr, and 24rl may mention later -- effective -- a conductor -- 25f (effective the conductor in a focusing coil part) of parts the invalid which is set to 25t (effective the conductor in a tracking coil part), and other parts of each coils 23 and 24 do not contribute to generating of driving force -- a conductor -- they are Parts 26f (the invalid in a focusing coil a conductor part), and 26t (the invalid in a tracking coil a conductor part).

[0050] If a deer is carried out and electric power is supplied by the focusing coil 23 the part 23 located in the upper left among the focusing coils 23 -- it is called upper part 23ldu of partial 23ld located in lower part 23lud and the lower left of lu -- effective -- a conductor -- the same direction as partial 25fl (effective the conductor in two focusing coils located in left-hand side part) -- for example The other current flows to the left. Among the focusing coils 23, at the upper right Lower part 23rud of located partial 23ru it is called upper part 23rdu of partial 23rd located in the lower right -- effective -- a conductor -- it can set in the focusing coil located in the above-mentioned left-hand side at partial 25fr (effective the conductor in two focusing coils located in right-hand side part) -- effective -- a conductor - - the direction where partial 25fl is reverse -- that is Since the polarities of the magnets 7l. and 7r with which the other current flows to the method of the right, and these counter it, respectively differ, The migration force to the direction same as a coil substrate 8 will arise, and the lens attachment component 5 will be moved in the vertical direction of focusing, i.e., the direction, to the base substrate 2.

[0051] Moreover, if electric power is supplied by the tracking coil 24 tracking coil 24l. located in left-hand side -- effective -- a conductor -- a part A current flows toward a direction which is different in partial (effective conductor in tracking coil located in left-hand side part) 25tr. (Effective the conductor

in the tracking coil located in left-hand side part) tracking coil 24r located in 25tl and right-hand side is effective -- a conductor -- left-hand side is effective -- a conductor -- partial 25tl and right-hand side are effective -- a conductor -- in partial 25tr, since polar magnets 7l. and 7r different, respectively are countered The migration force to the direction same as a coil substrate 8 will arise, and the lens attachment component 5 will be moved in the horizontal direction of tracking, i.e., the direction, to the base substrate 2.

[0052]

[Effect of the Invention] So that clearly from the place indicated above the biaxial actuator of this invention optical pickup It is the biaxial actuator of the optical pickup which has the focusing coil and tracking coil which were wound spirally. It consists of a part. the above-mentioned focusing coil and/or a tracking coil counter with a magnet, and are contributed to generating of driving force -- effective -- a conductor -- the invalid which does not counter with a part and a magnet and does not contribute to generating of driving force -- a conductor -- the above -- effective -- a conductor -- a part is formed in the shape of an abbreviation straight line -- having -- moreover, the above-mentioned invalid -- a conductor -- a part -- the above -- effective -- a conductor -- the die length of the focusing coil containing a part or the whole tracking coil it is wound around a rectangle and the same die length is effective -- a conductor -- it is characterized by forming in the shape of an anomaly so that it may become short as compared with the die length of the focusing coil which has a part, or the whole tracking coil.

[0053] therefore, the magnet [according to this invention optical pickup] in a focusing coil and/or a tracking coil and the invalid which does not counter -- a conductor -- the die length of a part is wound by the rectangle and the same die length is effective -- a conductor -- it can shorten as compared with it of the focusing coil which has a part, and/or a tracking coil, a miniaturization and lightweight-izing of the part and a coil can be attained, and, thereby, the response property of a biaxial actuator can be raised.

[0054] In addition, although the focusing coil and the tracking coil were formed by forming a circuit pattern in a printed circuit board in the above-mentioned example This invention may wind not only this but copper wire, and may form a focusing coil and/or a tracking coil. In short an invalid -- a conductor -- effective in a part -- a conductor -- the die length of the focusing coil containing a part or the whole tracking coil it is wound around a rectangle and the same die length is effective -- a conductor -- what is necessary is just to make it form in the shape of an anomaly so that it may become short as compared with the die length of the focusing coil which has a part, or the whole tracking coil

[0055] Moreover, in the above-mentioned example, although what formed both the focusing coil and the tracking coil in the shape of an anomaly was explained, this invention may form one coil not only of this but focusing coils or tracking coils in the shape of an anomaly.

[0056] Furthermore, although what was applied to the so-called moving coil type which a coil is supported through an parallel link and moves to a base substrate in the above-mentioned example was shown, not only this but a coil fixes to a base substrate, and a magnet is supported by the parallel link etc. and can also apply this invention to the so-called MUBINGU magnet type whose migration was enabled of biaxial actuator.

[0057] In addition, it does not pass over the concrete configuration thru/or the structure of each part shown in the above-mentioned example to what showed a mere example of the somatization which is in charge of operation of this invention, and the technical range of this invention must not be restrictively interpreted by these.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] An example of operation of the biaxial actuator of this invention optical pickup is shown with drawing 2 thru/or drawing 8 , and this Fig. is a perspective view.

[Drawing 2] It is a top view.

[Drawing 3] It is the sectional view which meets the III-III line of drawing 2 .

[Drawing 4] Each coil element by the circuit pattern formed in the light-gage printed circuit board of each class with drawing 5 thru/or drawing 7 is shown, and this Fig. is a front view of the printed circuit board of the 1st layer.

[Drawing 5] It is the front view of the printed circuit board of the 2nd layer.

[Drawing 6] It is the front view of the printed circuit board of the 3rd layer.

[Drawing 7] It is the front view of the printed circuit board of the 4th layer.

[Drawing 8] It is the schematic diagram showing the physical relationship of each coil and a magnet.

[Drawing 9] An example of the biaxial actuator of the conventional optical pickup is shown with drawing 10 and drawing 11 , and this Fig. is a top view.

[Drawing 10] It is the sectional view which meets X-X-ray of drawing 9 .

[Drawing 11] It is the schematic diagram showing the physical relationship of each coil and a magnet, and (a) shows the relation between a focusing coil and a magnet, and (b) shows the relation between a tracking coil and a magnet.

[Description of Notations]

1 Biaxial Actuator

7 Magnet

25 Effective -- Conductor -- Part

25f it can set in a focusing coil -- effective -- a conductor -- part

25fl(s) a left-hand side focusing coil is effective -- a conductor -- part

25fr(s) a right-hand side focusing coil is effective -- a conductor -- part

25t it can set in a tracking coil -- effective -- a conductor -- part

25tl(s) a left-hand side tracking coil is effective -- a conductor -- part

25tr(s) a right-hand side tracking coil is effective -- a conductor -- part

26 Invalid -- Conductor -- Part

26f the invalid in a focusing coil -- a conductor -- part

26t the invalid in a tracking coil -- a conductor -- part

[Translation done.]

* NOTICES *

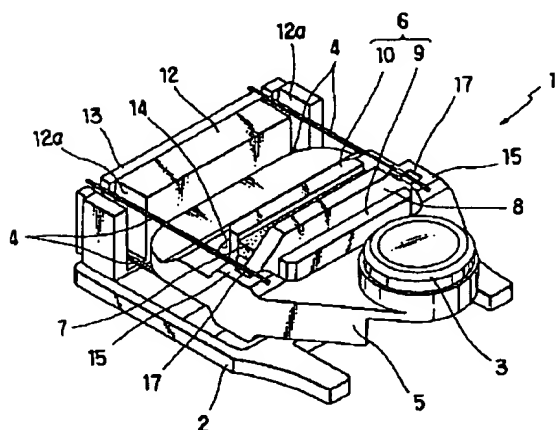
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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

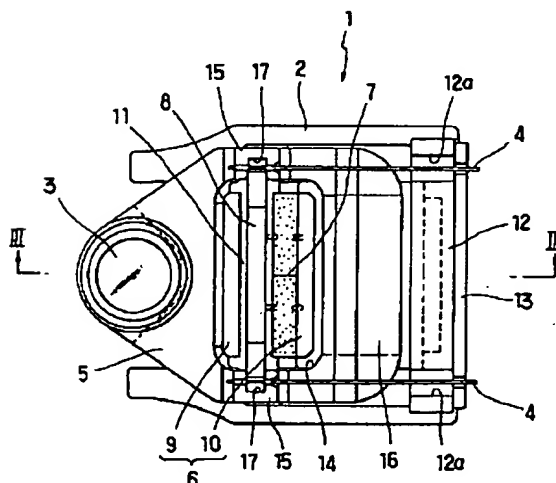
[Drawing 1]

1 . . . 2軸アクチュエータ
7 . . . マグネット



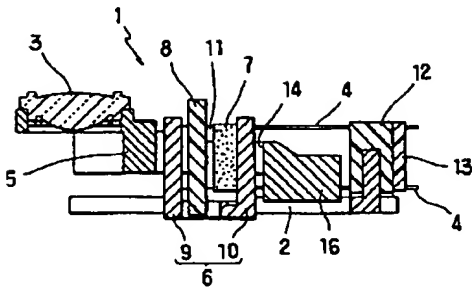
[Drawing 2]

1 . . . 2軸アクチュエータ
7 . . . マグネット

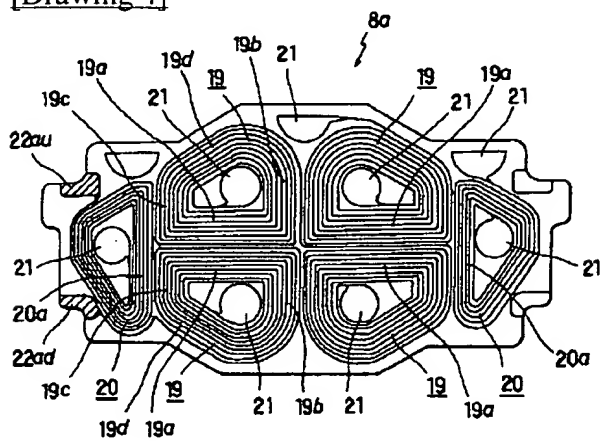


[Drawing 3]

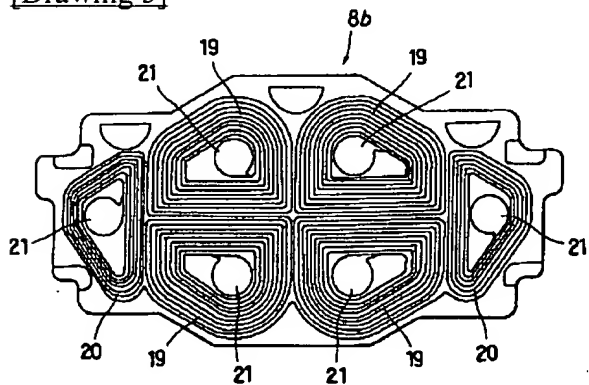
1・・・2軸アクチュエータ
7・・・マグネット



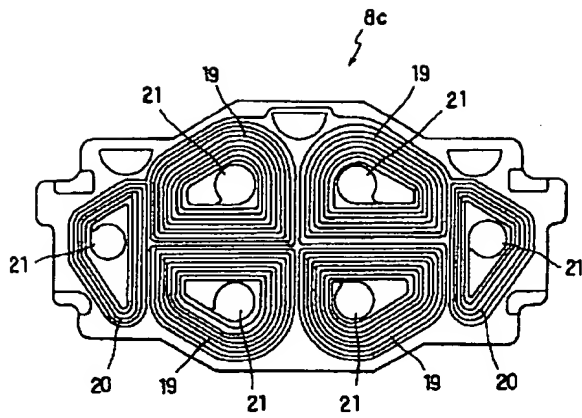
[Drawing 4]



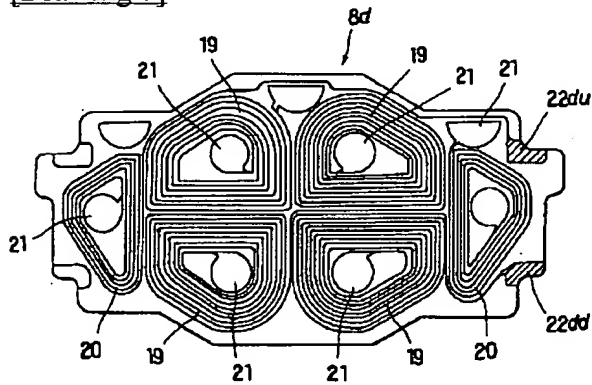
[Drawing 5]



[Drawing 6]

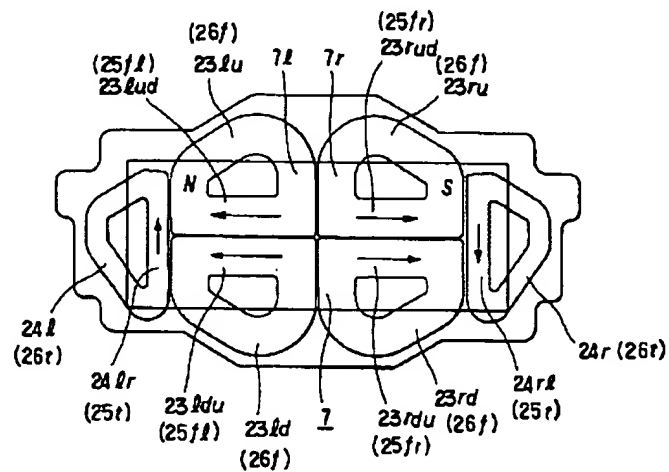


[Drawing 7]

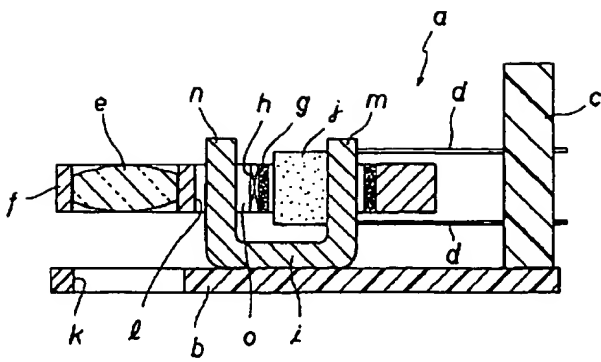


[Drawing 8]

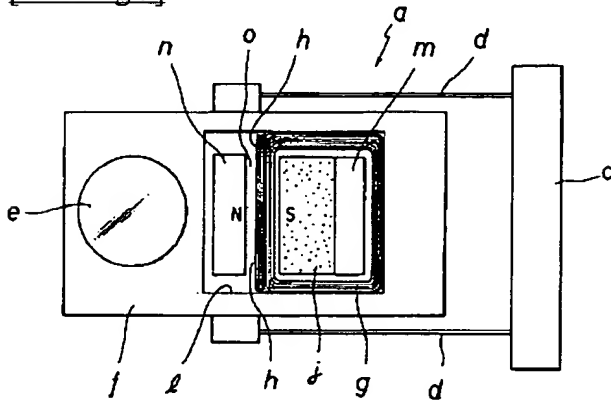
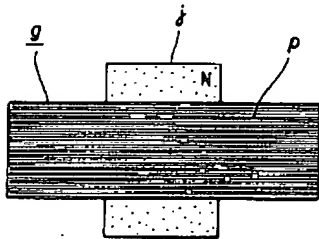
- | | |
|----------------------------------|---------------------------------|
| 25 . . . 有効導体部分 | 26 . . . 無効導体部分 |
| 25 f . . . フォーカシングコイルにおける有効導体部分 | 26 f . . . フォーカシングコイルにおける無効導体部分 |
| 25 fl . . . 左側のフォーカシングコイルの有効導体部分 | 26 l . . . トラッキングコイルにおける無効導体部分 |
| 25 fr . . . 右側のフォーカシングコイルの有効導体部分 | |
| 25 t . . . トラッキングコイルにおける有効導体部分 | |
| 25 tl . . . 左側のトラッキングコイルの有効導体部分 | |
| 25 tr . . . 右側のトラッキングコイルの有効導体部分 | |



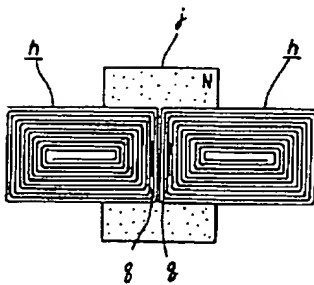
[Drawing 10]



[Drawing 9]

[Drawing 11]
(a)

(b)



[Translation done.]